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The trajectory of a startup: NFleet Oy

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Abstract

Technological development has enabled a new breed of innovation, from which new type of companies, startups have emerged. The operational environment of these kinds of companies is far different from traditional businesses, and new frameworks have been introduced to help startups find a development path to growth. The objective of the study was to compare the trajectory of a Finnish startup NFleet to three startup frameworks to see, if it is following a similar path, and to evaluate the value the frameworks could offer to the company. NFleet's background is in the University of Jyväskylä and it does transportation optimization software.

A qualitative approach and a case study strategy was selected in order to gain a deep understanding of the subject. First, three startup frameworks – Customer development, Lean startup and Startup genome – were presented, after which the trajectory of NFleet was analyzed and compared to the frameworks. The data collection methods used in this study were participant observation, documentary analysis and semi-structured interviews.

The research results indicated that there has been many common elements in the development of NFleet and in the frameworks. The university background has had a clear effect on the trajectory of NFleet and the way the technology and business were being developed. The value of the frameworks lie in the leading ideas and concepts rather than step-by-step development instructions.

Keywords/tags (subjects)

NFleet, startup, growth, Customer development, Lean startup, Startup genome, SaaS, optimization

Miscellaneous

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Tiivistelmä

Teknologinen kehitys on mahdollistanut uudenlaisia innovaatioita, joiden avulla on syntynyt uudentyyppisiä startup-yrityksiä. Tällaisten yritysten toimintaympäristö eroaa perinteisistä yrityksistä valtavasti, minkä vuoksi uusia viitekehyksiä on kehitetty auttamaan startup-yrityksiä löytämään oikea tie kasvuun. Tutkimuksen tavoitteena oli verrata NFleetin kehityskulkua kolmeen eri startup-viitekehykseen ja selvittää, seuraako NFleet samankaltaista uraa. Lisäksi tavoitteena oli arvioida viitekehyksien yritykselle tarjoamaa arvoa. NFleet on Jyväskylän yliopistolta peräisin oleva yritys, joka tekee kuljetustensuunnitteluohjelmistoa.

Kvalitatiivinen lähestymistapa ja tapaustutkimusstrategia valittiin, jotta aiheesta saataisiin syvällinen ymmärrys. Aluksi esiteltiin kolme startup-viitekehystä – Customer development, Lean startup ja Startup genome, minkä jälkeen NFleetin kehityskulku analysointiin ja sitä verrattiin kyseisiin startup-viitekehyksiin. Tiedonkeruumenetelminä käytettiin osallistuvaa havainnointia, kirjallisia aineistoja ja teemahaastatteluja.

Tutkimustulokset osoittivat, että NFleetin kehityskulussa oli useita selkeitä yhteneväisyyksiä startup-viitekehyksiin. Yliopistotaustalla oli kuitenkin selkeä vaikutus NFleetin kehityskulkuun ja tapaan, jolla teknologiaa ja liiketoimintaa kehitettiin. Startup-viitekehysten arvo löytyy pääasiassa niiden johtavista ajatuksista ja konsepteista eikä niinkään tarkoista kehitysaskeleista.

Avainsanat (asiasanat)

NFleet, startup-yritykset, kasvuyritykset, Customer development, Lean startup, Startup genome, verkkosovelluspalvelu, optimointi

Muut tiedot

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1 Introduction

The Internet has become an important part of our everyday lives, revolutionizing the world in many ways. In business, it has enabled an environment where new types of innovations thrive and companies can have enormous growth prospects. Multiple examples of companies can be found that have grown very rapidly from a zero to a multimillion dollar valuation. These kinds of success stories have raised considerable interest towards such companies among investors, consumers and governments. These types of companies are *startups*.

In literature, many definitions of a startup can be found. According to Paul Graham (2012) a startup is “a company designed to grow fast”; Steve Blank (2010) defines it as “an organization formed to search for a repeatable and scalable business model”; Eric Ries (2011, 27) suggests that a startup is “a human institution designed to create a new product or service under conditions of extreme uncertainty” – just to name a few. Regardless of the definition, they are a hot topic today.

Many startups operate in a high technology environment. Three common characteristics are known to shape this sector. They are market uncertainty, technological uncertainty and competitive volatility, all of which increase the complexity of the market faced by the companies. Market uncertainty refers to the fear, uncertainty and doubt of the customers towards the technology. Technological uncertainty comes from not being sure, if the technology actually meets the expectations. Finally, competitive volatility is about the changes in competitive environment and competitors. (Mohr, Sengupta, & Slater 2009, 11-16)

A business model that is becoming increasingly common in the Internet era is SaaS (software as a service). According to the Gartner definition, SaaS is “software that is owned, delivered and managed remotely by one or more providers” (Software as a Service [SaaS] 2013). SaaS solutions offer customers the benefit of not having to install or maintain the software. The software is accessed through the Internet and all the rest is left to the service provider. For the customer this often means easier and faster deployment along with predictable costs and performance. Since the maintenance is left to the service provider, the customer does not need to prepare

for additional maintenance fees or costs for updating the software. The users become subscribers of the software, and pay e.g. a monthly subscription fee for the software. To the service providers this increases financial risk, since it can take months – even more than a year – to breakeven on each customer (Colao 2012).

This thesis looks into the challenging but interesting world of a newly established Finnish SaaS startup, NFleet.

1.1 NFleet

NFleet is a Jyväskylä-based startup, set up in June 2014. The company focuses on transportation optimization on road networks. They offer an online transportation optimization service. The NFleet application is used by first uploading an input file containing the detailed information about the transportation tasks and the fleet of vehicles in use. Then the application creates an optimized transportation plan by clicking the *optimize* button. After a few minutes, the user receives the optimized routes. The optimization can also be used directly through an application programming interface (API). This allows integration to an existing enterprise resource planning (ERP) or transportation management system (TMS), so that the existing software is directly linked to the optimization engine, thus removing the need to upload the data manually.

History

The roots of the company are strongly connected with the University of Jyväskylä. Although the company was set up in June, the development of the optimization has been going on for a number of years. From 2008 onwards several research projects were conducted in the University of Jyväskylä in the area of optimization. In 2012 the last University project on the subject, CO-SKY, started. The project was funded by Tekes, a Finnish funding agency for innovation, and the main goal was to make preparations for the commercialization of the research results. In 2014, as the research project was ending, the final decision on setting up the company was made. Most of the researcher group decided to leave the University and take the leap to the corporate world.

Technology

Optimization has been studied in universities around the world for quite some time. In general, an optimization problem has a set of *decision variables*, which are the decisions the planner needs to make. The problem itself is to find values for these variables, which either minimize or maximize the value of an *objective function*, which describes the quality of the solution. However, the values of the decision variables have a set of *constraints*, which limit the values that can be given to them. The constraints refer to the rules which need to be followed in the planning. Essentially it is a tool for decision making. (Puranen 2011, 30-32.) In vehicle routing problem optimization many researchers are in fact competing with the results they get in standardized academic benchmark cases (Asikainen 2014, 24).

There are many variants of the vehicle routing problem. The travelling salesman problem is the simplest of the variants. In that problem type, there is a single vehicle which needs to visit a given set of locations one time only and return to the starting location, traveling the minimum distance possible (Asikainen 2014, 12). The capacitated vehicle routing problem is more complex than traveling salesman problem. In that problem type there are more than one vehicles, each having a certain capacity. This fleet of vehicles needs to transport a given capacity of goods to a given set of locations and return to the start location. The pickup and delivery problem adds another layer of complexity to the problem by not having one specific *depot* from where the transported goods are picked up, but they can each have a unique location. There are multiple variations of these problem types, adding e.g. time windows, multiple depots or other constraints. (Puranen 2011, 33-42.)

In simple problems, *exact methods* can be used for finding the best possible solution, but these methods are only able to solve problems of limited size. To describe the computational complexity of even the simpler problems, a travelling salesman problem with 80 locations already has around 40 times more possible solutions than there are atoms in the whole universe (Johnson 2014). This means that finding *the best possible* – the absolute optimal – solution for large and complex cases is realistically impossible, because even with modern computers, it would simply take too much time to go through every possible solution. To solve these problems,

approximate methods are used. The approximate methods can be divided into two main families: heuristic and metaheuristic. Metaheuristic methods have proven to be most efficient for solving the problems in practice. In simple terms the metaheuristics could be seen as guiding principles of guiding principles to find the optimal solution. This method of solving problems basically tries out millions of different scenarios and eventually picks the best, producing good solutions within an acceptable time frame (Puranen 2011, 68). The challenge for commercial applications is just that: producing good results in a limited amount of time, at the same time taking into consideration numerous different variables and restrictions, such as time windows, capacities and compatibilities.

The NFleet optimization uses metaheuristic methods. It can solve complex vehicle routing problems and includes time windows, capacities, compatibilities and pickup and delivery problem among other things.

Competitive environment

Compared to the amount of research done in the sector, relatively few commercial applications exist. Although there are some companies offering optimization, the number of competitors in the industry is rather small, and most of them seem to be mainly targeted to larger companies (Asikainen 2014, 71). The traditional way of offering optimization is selling a software, which is in many cases customized to a certain extent (Drexl 2011, 5). This takes large amounts of time and money to get up and keep running. In addition to the initial investment the user normally needs to pay annual license fees, maintenance fees and other additional costs. For small and medium sized enterprises these solutions are often too expensive, complex and time consuming to take in use.

NFleet has a different approach. As stated earlier they offer the optimization software as a service (SaaS). The one month subscription based pricing lowers the risk for the customers and makes the costs very predictable. In the optimal situation the NFleet application can be taken into use in a matter of hours. The customers do not need to make large investment decisions, in fact quite the opposite. They can start using it with significantly lower risks of something going wrong with the

software project – which is more than likely. According to The Standish Group (2013, 1) more than 60% of IT-projects fail completely or are not delivered on time, on budget or according to the original specifications.

Although there are a small number of companies offering optimization as a SaaS solution, the SME sector is still quite an unserved market. The SaaS solutions can be seen as disruptive technology in the sector.

Customers

Since the NFleet is a disruptive innovation in many senses, not every potential customer is ready to adopt it. Geoffrey Moore's technology adoption lifecycle (see Figure 1) describes how new technologies are adopted. It divides the users into five categories: innovators, early adopters, early majority, late majority and laggards. Between these groups there are cracks in the technology adaptation curve visualizing the differences in needs between the groups. The chasm between early adopters and early majority is one of the key challenges for companies offering new technologies, if they are lucky enough to reach that point. Moving to the early majority is a difficult task since they require very different offering compared to the early adopters. The current customers of NFleet are on the left side of the curve, innovators and early adopters to be more specific.

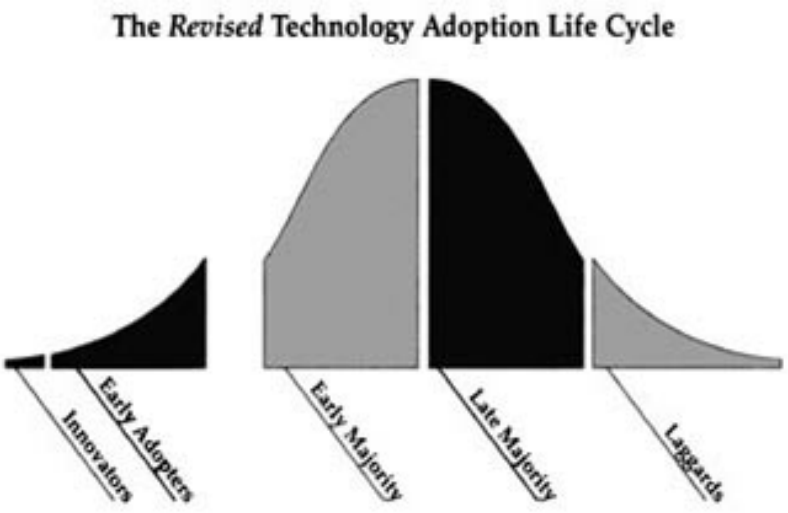

Figure 1. Technology adoption life cycle (source Moore 2001, 13)

There are five main segments, which NFleet aims to serve:

- transportation SME's, mobile workforce, & public sector;
- TMS/ERP providers;
- developers;
- logistics consultants; and
- academics & teachers.

To transportation SME's NFleet can offer reduced planning time, agility in both strategic and operational planning, a better capacity utilization and more efficient routes. This segment also includes companies which are not transportation companies but plan and implement their logistics themselves, e.g. bakeries. Additionally all other end-users, e.g. in mobile workforce and public sector belong in this segment. One of the challenges in the beginning with small transportation companies can be that they might not have all the necessary data in an electric format. That means a need for some manual work in the taking the service in use. Electronic data formats are usually very easy and quick to transform into the correct format for using in the application.

ERP/TMS providers can add a considerable amount of value to their software by integrating optimization in it. This functionality can broaden their potential market, bring them more customers and serve their current customers better. NFleet optimization has been designed in a way that it is easy to integrate with the existing software and NFleet can offer the API for free to anyone interested in the integration.

Additionally NFleet fully supports and attempts to create a network of people who can create new business around the existing platform and service. This could mean developing new applications or using NFleet in logistics consultation. Moreover, NFleet encourages using the application for educational purposes. One of the

benefits of networking is that it allows companies to reach multiple industries and to reduce the feeling of uncertainty (Neuvonen 2014, 164-169).

These segments are different in nature and need different approaches. To both the network and the ERP's NFleet can be seen as a PaaS (platform as a service) solution, enabling them to build something new on top of the NFleet platform.

1.2 Research objectives and questions

Startup companies work in conditions of extreme uncertainty (Ries 2011, 27) and – unfortunately – the reality is that the majority of them actually fail (Nobel 2011). Although the reasons for the failures might vary, one issue many startup frameworks agree on is that the traditional ways of managing businesses do not fit very well into the uncertain startup environment. This is a common problem for startups: they are not small versions of large companies (Blank 2012). The management and business development needs to reflect this by acquiring a different type of approach compared to large companies.

The objective of this thesis is to see if NFleet's trajectory has common elements with the startup frameworks to be discussed in this thesis and assess what value the frameworks could offer NFleet. As Blank states in his *The Four Steps to the Epiphany*, the successful startups he had been involved with all followed the model he describes, either knowingly or unknowingly (Blank 2007, iv). The Startup genome Report states that consistently advancing startups are more likely to succeed (Marmer et al. 2011a, 6). This does suggest that there are reasons to follow these sorts of frameworks, thus for NFleet knowing if their trajectory is in line with these frameworks provides valuable insight. The research questions are:

- What has the trajectory of NFleet been so far?
- How consistent is NFleet's trajectory with startup frameworks?
- What value could the frameworks offer to NFleet?

For this research three main frameworks were selected for the comparison: Steve Blank's Customer development, Eric Ries' Lean startup and the Startup genome Report by Max Marmer, Bjoern Lasse Herrmann, Ertan Dogrultan and Ron Berman.

These frameworks were selected since they all have clear links to high tech IT-startups. There are numerous frameworks for startup companies, but due to the limited resources of this research, only those three are used.

2 Methodology

A suitable methodology is important for a successful implementation of the research. It defines the researcher's view of the world and tells the reader how the research was conducted so that one can better evaluate the reliability and validity of the research. In the following subchapters the methodology of this thesis will be presented.

2.1 Research philosophy, approach and strategy

Philosophy

The research philosophy in this study is critical realism. The researcher sees the nature of reality as objective, but acknowledges that it is interpreted by individuals. Experiencing the reality has two steps: sensing and then processing the sensation. (Saunders, Lewis, & Thornhill 2009, 115.) This means that the objective reality is impossible to prove, but we behave as if the reality, as we see it, was objective (Easton 2010, 119). The critical realism thus acknowledges that the researcher is somewhat biased, which naturally has an effect on the research itself. Although this study aims to be as objective as possible, it is understood that perfect objectivity and the absolute truth is impossible to achieve.

Approach

The research approach in this study is qualitative. Kananen (2010, 37) defines qualitative research as all other research besides quantitative research, which deals with numbers and their relations. In other words qualitative research deals with words and sentences rather than numbers (Kananen 2008, 24). Quantitative approach would not have suited for this research, since very little useful numerical data could have been analyzed. This is why the qualitative approach suited this study better. Moreover, Denzin and Lincoln (2005, 3) explain that qualitative research

studies “things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them”.

The goal of this study is not to create new theory or to be able to generalize the research results, but to find how theory relates to practice in a single company. While inductive research is moving from practice into theory, deductive research moves from theory to practice (Gray 2014, 18), which is the case in this research. This study is constructed by looking at relevant literature and then comparing that theory in a practical context. Since the research is done for a single company, there is no need to create a new framework or a theory, but to create useful and relevant knowledge for the company.

Strategy

The most suitable design for this study was a single-case study, because it enables to get a holistic and meaningful picture of a contemporary phenomenon (Yin 2009, 4). As this research focuses on a single company and its trajectory, a broad understanding of the case company, its surroundings and its procedures is required. In a single-case study this can be achieved by using multiple sources of data (Creswell 2007, 78-79). Being an active participant in the company ensures an access to wide array of data, thus enabling a case study strategy. Kananen (2013, 54) summarizes the requirements of a case study so that the research:

- is about a contemporary phenomenon;
- takes place in its natural context;
- is using multiple sources of data;
- requires deep and rich understanding about the subject; and
- has usually one research subject (case).

This research concerns a startup company, which can be seen as a contemporary phenomenon. In order to dig deep into the company’s trajectory and studying whether its trajectory is consistent with frameworks, which enables better prospects for a startup, it is necessary to focus the efforts in understanding the company and its context. Yin (2009, 18) emphasizes the importance of context in case study

research and states that in case studies the boundaries between phenomenon and the context are not clearly evident. This is one of the reasons case study strategy fits this research well.

This study additionally incorporates elements from action research. In action research it is common that the researcher is a part of the organization being researched (Kananen 2009, 9). In addition to being a part of the organization, a natural effect is that one form of data collection method is participant observation. According to Kananen (2009, 23) one basic difference between these two strategies is the role of the researcher: in case study the researcher is not a part of the organization. In this study, the researcher is an active participant in the organization and participant observation is one of the data collection methods. Although, some elements of action research are being used, the critical elements of action research are missing in this study – this is why an action research strategy would not have been suitable in this case. The key difference is that action research is an iterative process, where you plan, act, observe and reflect – and repeat this cycle several times (Riel 2013). Action research focuses on action and promotes change (Saunders et al. 2009, 147), while case studies try to find a deep understanding of a subject. Figure 2 illustrates the action research cycles.

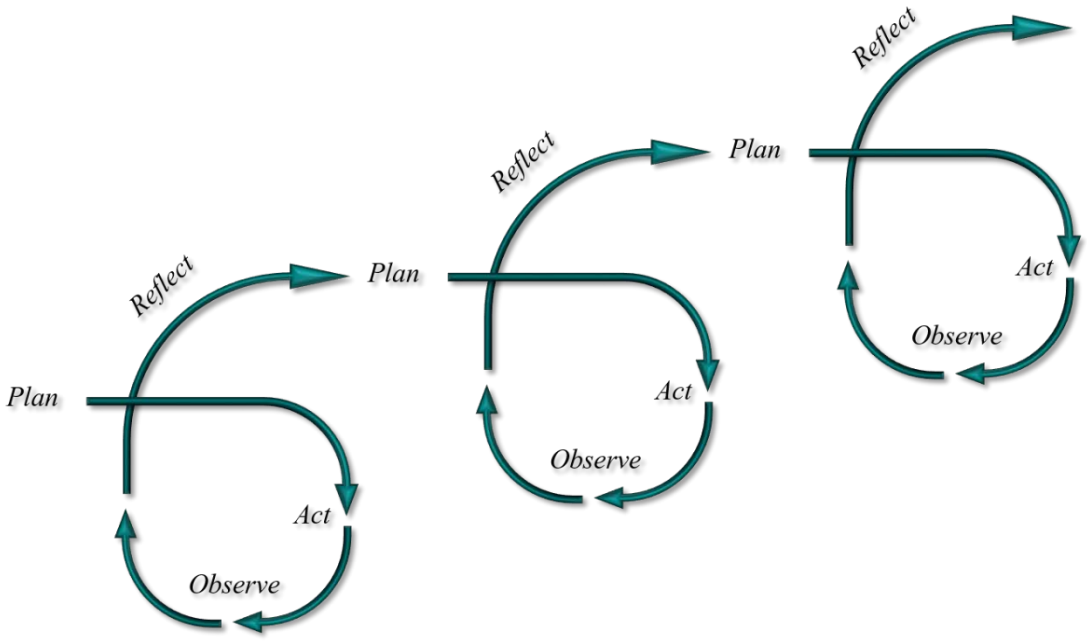

Figure 2. Action research cycles

2.2 Data collection

Participant observation

Case studies call for various sources of data. Since the researcher is an active participant in the company being researched, a natural source of data was participant observation. Involvement begun in January 2014, when the university research group took part in a startup program organized in JAMK University of Applied Sciences. At that time the interactions took place on a weekly basis. In June 2014 the researcher begun a practical training period in the company and since then has been involved in their daily operations.

Participant observation is not very commonly used in business research, although it has clear strengths: it allows the researcher to *feel* what is going on – not just seeing or hearing. It is a way for the researcher to understand the context much more thoroughly. (Saunders et al. 2009, 290.) There are four different roles that a researcher can have in participant observation, which are dependent on two factors: is the researcher's identity revealed and does the researcher take part in the activity (see Figure 3). In this research, the researcher took part in the activities and the identity was revealed, i.e. the personnel knew that research was being conducted about the company.

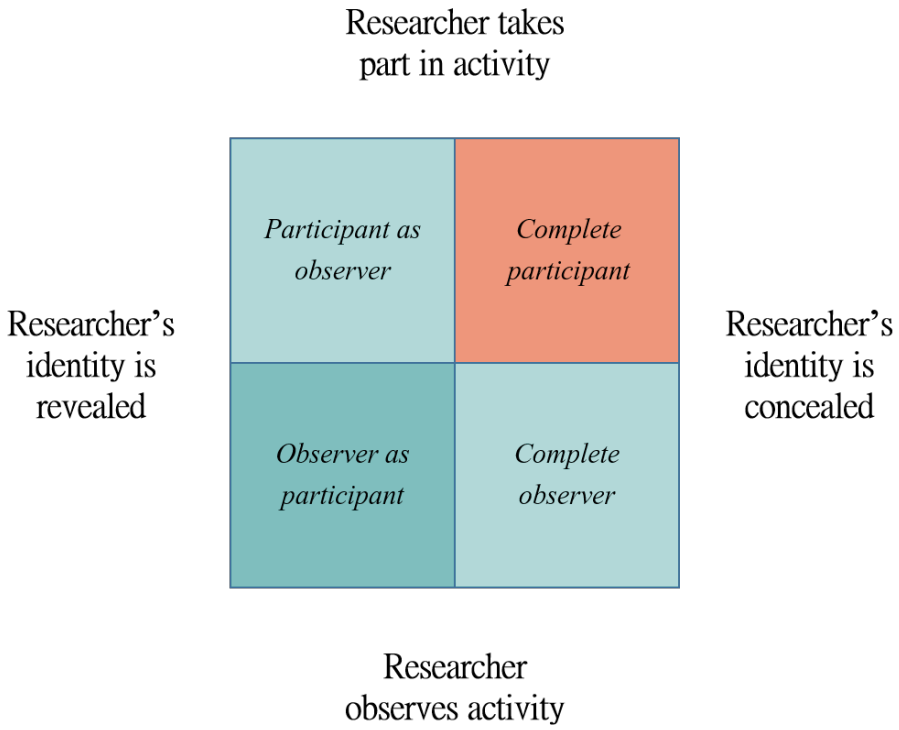

Figure 3. Researcher roles in participant observation (adapted from Saunders et al. 2009, 293)

Participant observation was the primary data collection method in this research. The observations made for this research are from multiple settings. The earliest observations took place in the JAMK University of Applied Sciences, when participating in lectures, doing different exercises and taking part in the coaching sessions of the startup program. For a few weeks in the beginning of the practical training period NFleet was working in the University of Jyväskylä before the company was established and the place of work moved to the current office. The observations about the company have taken place in internal meetings, customer meetings and everyday operations. The observations have primarily been documented in field notes and pictures of white board sketches.

Documentary data

Additionally there was an access to wide variety of documents, which were used in the analysis. The documents include the exercises prepared in the startup program,

university project plan and report along with numerous different types of internal documentation.

Saunders et al. (2009) state that documentary data is most commonly used in either action research or case study on a certain organization. Primary data is often used along with documentary data, although in some cases it might be sufficient on its own. (258-259.) These kinds of written documents are often necessary to understand a phenomenon related to companies, since the issues might be rather complex. On the other hand it is important to take in consideration to whom is the document written to, in order to be able to analyze its reliability and validity. (Kananen 2008, 82.) Most of the documentary data used in the research were documents, which were only meant for internal use, thus being as objective as possible.

Semi-structured interviews

The third form of data collection was semi-structured interviews inside the company. Creswell (2007) states that it is important to find a suitable place in which to conduct the interview. Selecting the interviewee has to be carefully considered too in order to find a person who is willing to share ideas and discuss the topic. (133.) Fortunately this was not as issue in this research since everyone in the company were open and ready to discuss these topics. Semi-structured interviews have themes which help the interviewer guide the discussion and cover the essential topics. One of the benefits of semi-structured interviews is that they allow interviewees explain their answers better and give the interviewer the freedom to probe deeper into interesting aspects that raise during the interview. (Saunders et al. 2009, 320-324.)

The interviews took place in the NFleet office on 21st and 22nd of October 2014 and were conducted in Finnish. The settings were calm and quiet. There were no distractions during the interviews, which enabled both the interviewer and the interviewee to concentrate on the topic itself. The duration of each interview was approximately 40 minutes. The interviews were recorded with the permission from the interviewees. A discussion guide was prepared with a focus on the time before the company was established and before the researcher was participating in the activities. Additionally, a few questions about the current situation were prepared in

order to gain a richer data set and not just having to rely on the participant observations and documentary data. The discussion guide is presented in the appendices.

2.3 Data analysis

Qualitative data analysis has four steps: segmenting, categorizing, coding and interpreting. Analyzing interviews has the same steps, but is preceded by transcribing the interview. Segmenting the data means that the researcher divides the data into smaller pieces, which are about a specific subject. Giving descriptive names to these segments is called categorizing. In the third phase the data is coded. This is a way to find the common subjects in the segments, which can then be put together for interpretation. In deductive research the categories of data can be drawn from the existing theories. (Kananen 2013, 104-105)

The analysis method used in this research was pattern-matching, which is commonly used in deductive research. Pattern-matching seeks to find if the patterns from existing framework correlates with the research results. (Saunders et al. 2009, 500.) After the collected data was segmented, categorized and coded, pattern-matching was used in the interpretation phase. The categories and codes of the collected data were taken from the existing startup frameworks.

Ethical issues

Having a broad access to company data means that the researcher needs to carefully consider, what can be reported and how the reporting should be done. With a broad access to data comes a considerable responsibility for handling the data in an ethical manner. Due to these reasons, no names or sensitive company information are disclosed in this research.

3 Literature review

There are various different frameworks, guidelines and advice available for startups – having different approaches and focus points. Many of these take a thorough look in the financing of a startup, focusing on venture capital. Since the objectives of this

thesis do not include finding a correct path to raise venture capital, nor is it currently relevant for NFleet, those issues will not be discussed in this research.

In the following subchapters the frameworks discussed are Customer development, Lean startup and Startup genome.

3.1 Customer development

Steve Blank noticed a gap in the theoretical frameworks for startups. He realized that the traditional methods for managing businesses do not work in a startup environment. He found that there is a need for something more in addition to product development. The Customer development model was created to support product development and took in consideration more than just the product: *the customers*. (Blank 2007, viii-ix.)

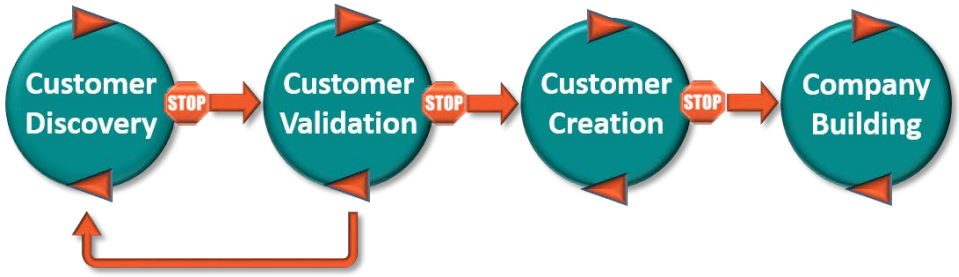

Figure 4. Customer development model (adapted from Blank 2007, 19)

The Customer development model is a company life cycle model which is divided into four steps: customer discovery, customer validation, customer creation and company building (see Figure 4). Each of these steps are divided into four phases, are iterative in nature and have certain milestones, which need to be achieved before moving on to the next stage. Moreover, before moving to the next step, a critical evaluation has to be carried out to see if the company is ready move to the next stage.

Blank defines three main market types in which the companies can operate: existing market, resegmented market and new market. The chosen market type affects the

operations of a startup. In an existing market the companies compete on the performance of products, while in resegmented market companies can take either a low-cost or a niche strategy. Niche strategy targets a smaller segment in the market with specific needs while low-cost strategy targets the segment which is the most price sensitive. New market approach on is about creating new demand, which means that the biggest competitor is non-consumption and other startups. In this type, low rate of adoption is the greatest risk. The performance of new market products is low in traditional attributes. (Blank 2007, 53-57)

One of Blank's interesting discoveries is that startup companies exist to search for a repeatable and scalable business model (Blank 2010). This means a fundamental change in the thinking and approach for the companies: the reason for their existence is not to create shareholder value, to make the world a better place or anything alike, but to *learn* how to do it. The emphasis is on learning, not executing a plan. In this definition it is also a built-in feature that companies more than likely need to change the direction they are heading, in order to find the repeatable and scalable business model.

The following subchapters will briefly explain, what these steps are, what is the internal iterative cycle and most important milestones of each step. A thorough explanation of this model and detailed descriptions of each step and phase can be found from Blank's book *The Four Steps to the Epiphany*.

Customer Discovery

Customer discovery is the first step in Customer development. During this step companies need to find a problem/solution fit – meaning that they need to know the problem they are solving and see if the solution offered actually solves the problem. In this phase companies need a first product or a prototype. It is a product that has only the critical features and can actually be somewhat incomplete, even flawed. This product is then tested to see, if there is a potential market and potential customers for it. (Blank 2007, 31-39.)

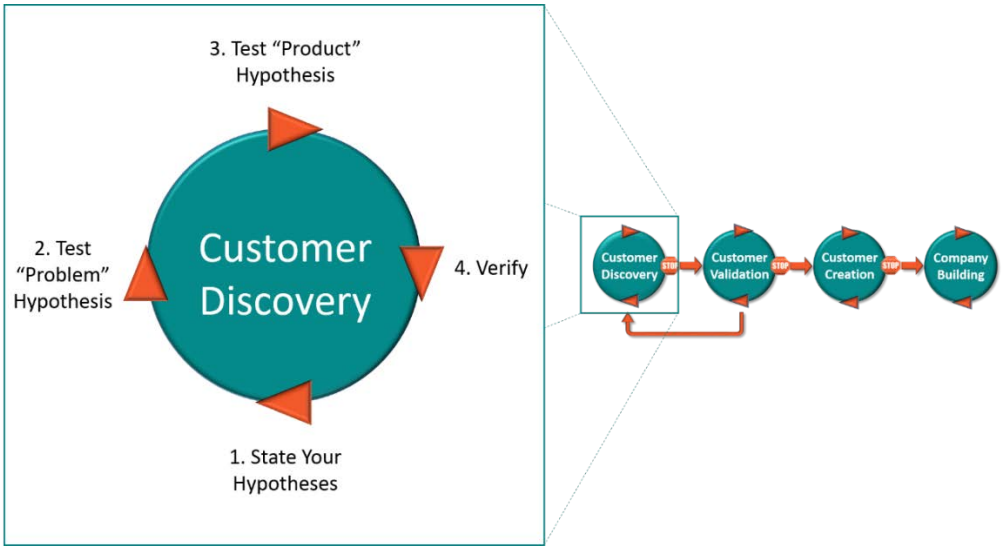

Figure 5. Customer Discovery (adapted from Blank 2007, 37)

Above, Figure 5 illustrates the four phases of the customer discovery stage. It all actually begins with the phase 0, which is not shown here. Phase 0 is to come to a common agreement within the organization that the Customer development framework will be used and people commit to it (Blank 2007, 39). Only then can the phase one begin. At the first stage the company needs to state their hypotheses on six things:

- product,
- customer,
- channel and pricing,
- demand creation,
- market type, and
- competitive hypotheses. (Blank 2007, 40.)

The Merriam-Webster dictionary defines hypothesis as "an idea or theory that is not proven but that leads to further study or discussion". This is exactly what the company needs to do. They need to make assumptions based on what they believe is true and then, as Blank (2012) stated, "there are no facts inside your building, so get the heck outside". By interacting with the first visionary customers – the

earlyvangelists – the companies can test their hypotheses, refine them and eventually validate them.

The first contacts with the customers are about testing the problem hypothesis and understanding the customer. It needs to be found out if the assumed problem of the customer is real and critical enough, and if the solution offered to them can in fact solve the problem. In the third phase the initial product is presented to the customers with the goal of finding out if the product is something they could consider purchasing. (Blank 2007, 61-67.) In the verifying stage all the previous activities need to be critically reviewed to see if the hypotheses have proven to be correct or not.

Customer Validation

In the second step a repeatable sales roadmap needs to be crafted and tested (ibid., 82). During this step the company needs to make its first sales, but before that, it needs to be prepared to do so. This means developing a value proposition, a distribution channel map, sales materials and the sales roadmap. (ibid., 118.)

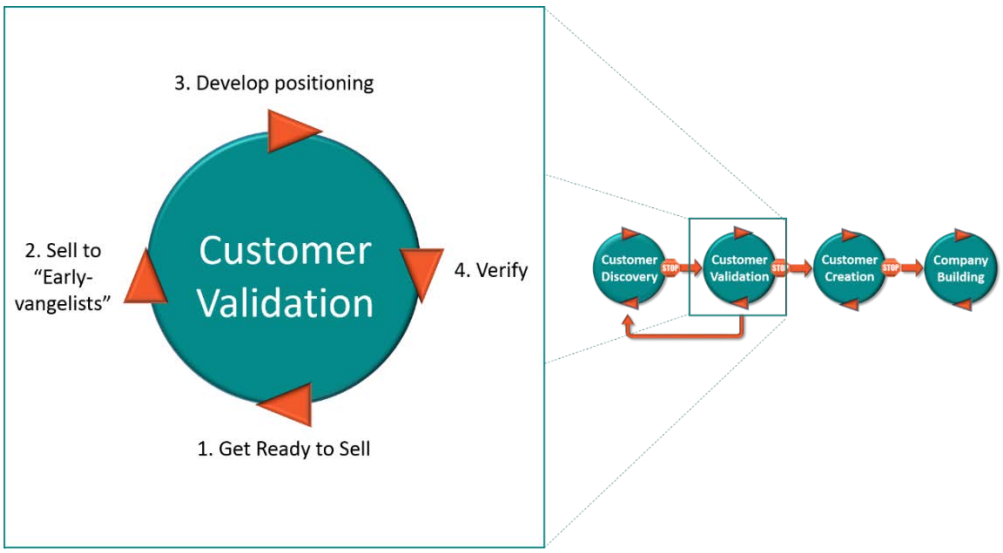

Figure 6. Customer Validation (adapted from Blank 2007, 85)

The next three phases in customer validation are: selling to earlyvangelists, developing positioning and verifying (see Figure 6). Selling is an essential validation technique to see if the customers are actually willing to pay for what the company is offering (ibid., 103). The positioning depends largely about the market type the company is in, but essentially boils down to the unique value the company can offer to the customers. Blank defines four distinctive market types: existing market, new market, resegmented low-cost and resegmented niche (ibid., 24-25). In new market the goal at this stage is to communicate the vision and passion, because no competition exists (ibid, 112).

The customer validation stage is about validating if you have something you can sell in a repeatable manner. At the end of the customer validation cycle – the verifying phase - you might even end up going all the way back to the customer discovery if the situation so requires.

Customer Creation

The last two steps in the Customer development model start turning the company into the execution mode (Blank & Dorf 2012, 22). At this point the most essential business hypotheses should have been validated and the company should really begin acquiring customers. The phases in customer creation are: get ready, position, launch and create demand (see Figure 7). In the first phase Blank suggests conducting an enquiry for the existing customers and prospects to reveal, how they see the company's market type in order to help decide which market type the company is in. In addition to the market type selection, the objectives for the first year sales should be defined. (Blank 2007, 133-137)

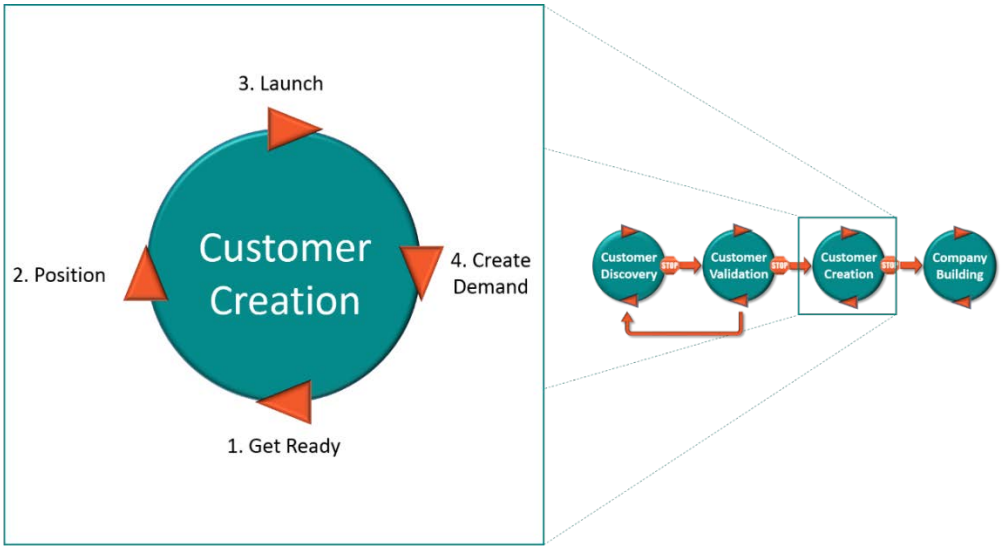

Figure 7. Customer Creation (adapted from Blank 2007, 132)

Blank (2007) suggests to hire a PR-agency in the beginning of the positioning phase. The value from the external specialists in the area comes from strategic communications along with giving help with the positioning. In addition to that, both internal and external positioning audits should be conducted before actually positioning the company. In the launch phase the company chooses the launch strategy, the target customers, formulates messages and decides the messenger. (140-144.) The last phase is about creating the demand creation strategy and deciding on the key metrics to track success (ibid., 153). Overall the customer creation boils down to "the essential marketing activities necessary to help customers learn about a product and create a desire to buy it" (ibid., 124).

Company Building

In the last step, company building, the goal is to transform the business from a startup into a company. Once the repeatable and scalable business model is found, the focus will shift from learning into execution and the company structure and operations are formalized. (Blank et al. 2012, 30.) In this step the four phases are: mainstream customers, management / culture issues, functional departments and fast response departments (see Figure 8).

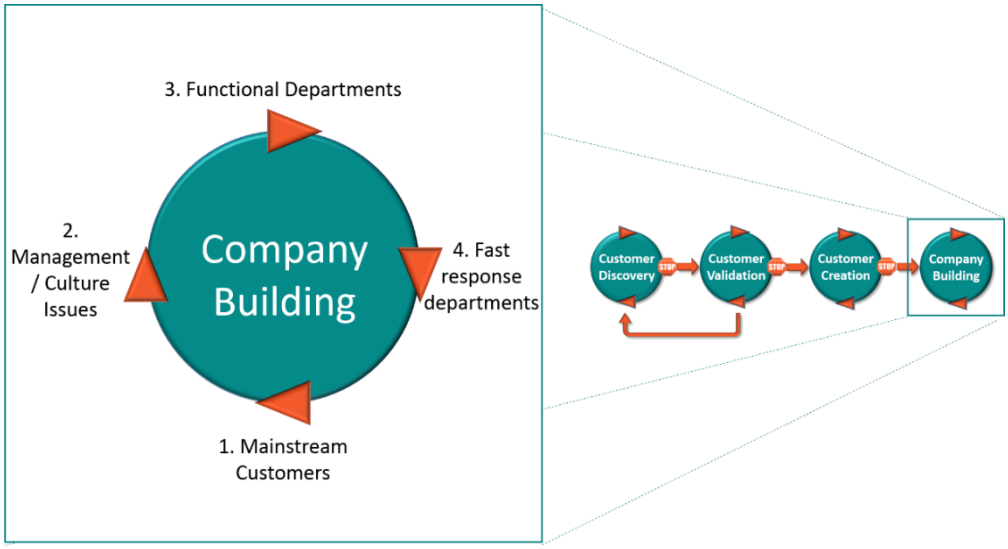

Figure 8. Company Building (adapted from Blank 2007, 169)

When aiming for the mainstream customers, the chasm between the early adopters and early majority has to be taken into account. These groups of customers are very different in nature, thus requiring a different approach from the company in acquiring them. The company needs to have well-established references, when targeting the early majority. (Moore 2001, 9.) The market type has a large effect on the width of the chasm, so the sales growth should be managed accordingly (Blank 2007, 170).

The management and culture of a company are crucial parts of making the company succeed. The culture needs to be purposefully built and management processes and procedures thought out. A great company will attract the best talents, which in turn make the company strong, competitive and sustainable. Blank notes that at this point companies should try to create a mission-centric organization and culture instead of a process-centric, which is common in large companies (ibid., 167).

Functional departments can make the company more effective, but it should be noted that the functional departments formed, are in line with the strategic needs. The point is not to simulate and copy a large company's departments, but to create the departments needed to achieve the customer-centric mission. Each department should have its own mission, which helps the company achieve its mission. (ibid. 167-168.)

The final phase is to make the departments able to response quickly, creating *fast-response* departments. This requires implementing the missions-centric culture and management, making sure that the departments have enough current information at hand and building a leadership culture. (ibid., 192.)

3.2 Lean startup

Eric Ries named the Lean startup framework after lean manufacturing developed at Toyota (Ries 2011, 18). One of its key concepts was minimizing *waste*, referring to anything that does not add value to the customer. Ries experienced waste personally at IMVU, working countless hours on perfecting and crafting thousands of lines of code which were eventually thrown away, because it was not what the customers wanted (Ries 2009).

Ries was involved with Steve Blank and his Customer development framework and took it as a guidance to his work (Ries 2011, 5). Common elements between these two frameworks can be found, but the Lean startup is not a step-by-step model – it provides tools and principles for managing a startup and emphasizes entrepreneurship. He defines a startup as “a human institution designed to create new products and services under conditions of extreme uncertainty”, and an entrepreneur as anyone working in a startup (ibid., 8).

The idea coming from Lean manufacturing of minimizing waste is important in the Lean startup framework. Ries realized that the waste could be minimized in a startup environment by developing the product in rapid iteration cycle. This *feedback loop* consists of three steps: Build, Measure and Learn (see Figure 9). By minimizing the time it takes to go around this loop, the waste can also be minimized. (Ries 2011, 76.) To minimize waste is to *do the right things*, not to do things right. It does not make a difference, how efficiently things are done if it is not the right thing. Through constant learning the company can find the right things.

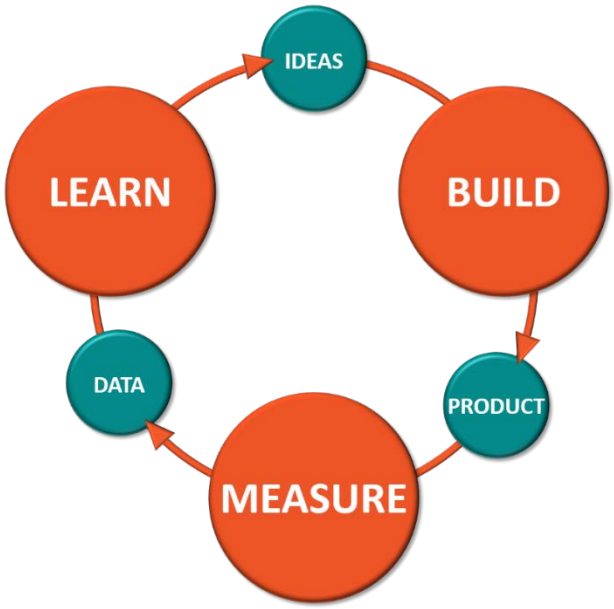

Figure 9. Feedback loop (adapted from Ries 2011, 75)

The feedback loop is probably the single most important tool from the Lean startup framework. It is used to steer the company in the right direction. Ries emphasizes a scientific approach, and it begins with making hypothesis. He defines two *leap-of-faith* assumptions: value and growth hypotheses. (Ries 2011, 76.) The feedback loop helps to validate these assumptions. The companies need to build a minimum viable product (MVP), a product that has the minimum features to be able to go around the feedback loop.

The MVP is then used to provide data about the progress by running experiments. Through the process of collecting and analyzing the data, the company can track the progress it is making and achieve *validated learning*. Ries uses the term *innovation accounting* to measure and achieve the learning milestones in an objective and scientific manner. (ibid., 77-78.)

It is highly important to measure the right things – a well-known fact in management. There is no point in collecting metrics the company cannot use or metrics that are about a wrong thing. The metrics the organizations track are naturally the ones they will try to improve, so attention should be paid to measure the right things. Ries calls the right ones *actionable* metrics and the wrong ones *vanity* metrics. The right metrics are dependent on the organization and its engine of growth. By measuring

vanity metrics, it can actually seem like the company is moving in the right direction, while it really might be doing the opposite (ibid., 135).

In the last phase of the loop, the company needs to decide whether it should pivot or persevere. Pivoting means making a major strategic change in the hypotheses. (ibid., 149.) If there is a fundamental flaw in some of the hypotheses, the company has to pivot in order to succeed. Minimizing the time through the feedback loop, the flawed hypotheses can be noticed in time and the company has the ability to respond to them before running out of time and money.

The growth hypothesis is the second leap-of-faith assumption. It relates to the way the company can achieve growth sustainably. Ries (2011) defines four different ways to achieve sustainable growth:

- *word of mouth,*
- *as a side effect of using the product,*
- *through funded advertising, or*
- *through repeat purchase or use.* (208.)

Along with these ways to achieve growth, Ries discovered three different *engines of growth* that can be used to scale. They are *sticky* engine of growth, *viral* engine of growth and *paid* engine of growth, which are presented in Table 1. (ibid., 209-219).

Table 1. The three engines of growth

	Sticky engine of growth	**Viral engine of growth**	**Paid engine of growth**
Principle	Retaining customers for the long term	A new customer brings in more new customers	Profit from a customer is used to acquire the next customer

The working principles of each are naturally different, which also means that they have different important actionable metrics to track. For sticky engine of growth, churn rate and new customer acquisition rate are highly important. Churn rate refers to the percentage of customers discontinuing their subscription or quit being a customer. The new customer acquisition rate, i.e. growth in number of customers, has to be larger than churn rate for the company having a sticky engine of growth to grow. (ibid., 211)

The viral engine of growth relies on each new customer bringing in more new customers. Viral coefficient is the key metric to be used with this engine of growth (ibid., 213). It tells how many new customers a customer brings in. Having a viral coefficient of one would mean that each new customer brings in one more customer.

The paid engine of growth relies on the profit of one customer to acquire the next. This means that the cost of acquisition has to be less than the profit in order to grow sustainably. (ibid., 216.) In e.g. SaaS businesses the customer lifetime value should be assessed to find out how much revenue and profit does one customer bring. Otherwise the numbers would likely seem quite discouraging. Compared to the traditional way of selling a license, it might take several years for the SaaS solution to earn the same revenue from a customer, meaning that the profits come far later than in the traditional way.

The Lean startup has raised much interest in the startup community and many entrepreneurs have begun to follow the model. The adoption of the ideas and principles introduced in the framework is happening on a wide scale, which suggests that the model is quite universal and actually works.

3.3 Startup genome

Marmer, Herrmann, Dogrultan and Berman created a foundation of a new milestones-based framework for internet startups by investigating more than 650 startups, later expanding to more than 3200 startups. They noticed that even though there is much knowledge in the area, the frameworks are still not utilized to their full extent and entrepreneurs are struggling with figuring out, where to focus and to which direction they should go. The three main points they discovered in their

research were that the development of a startups happen in different distinct stages, there are different startup types and that learning is actually a unit of progress in startup companies. (Marmer et al. 2011a, 1-4; Marmer et al. 2011b, 1.)

The stages of development that their research discovered are:

1. discovery,
2. validation,
3. efficiency,
4. scale,
5. sustain, and
6. conservation. (Marmer et al. 2011b, 7.)

The first four stages are loosely based on Blank's Customer development model (ibid., 6). The last two stages describe the company in its execution mode – when the company is not a startup anymore, but has grown past that. The discovery stage is about finding the problem/solution fit. Only when the problem/solution fit is found should the company advance in the validation stage to find the product/market fit. In the efficiency stage business and sales models should be refined in order to prepare for the next, scale stage when the company starts aggressively acquiring customers. (Marmer et al. 2011a, 14-15.) The Table 2 shows the first four stages compared in terms of average time to complete, top competitive advantages and key challenges.

Table 2. The first four Marmer stages (adapted from Marmer et al. 2011a, 7)

	Discovery	Validation	Efficiency	Scale
Average time to complete	5-7 months	3-5 months	5-6 months	7-9 months
Top competitive advantages	IP Technology	Partners Insider Info	Traction IP Insider info	IP Traction Technology
Key challenges	Customer acquisition Over capacity	Customer acquisition Product/market fit Problem/solution fit	Customer acquisition Team building Fundraising	Customer acquisition Team building

Figure 10 shows how the consistent companies that raised money view their competitive advantages in each stage. In the discovery stage, IP (intellectual property) and technology are seen as the most important. Partners, insider info and team are very close to each other while traction is the least important. Partners' importance raises tremendously in the validation stage, while IP is not seen as an important competitive advantage at this stage. As the companies are moving towards efficiency and scale stages, traction and IP become increasingly important competitive advantages. Partners and insider info are seen as less important towards the scale stage.

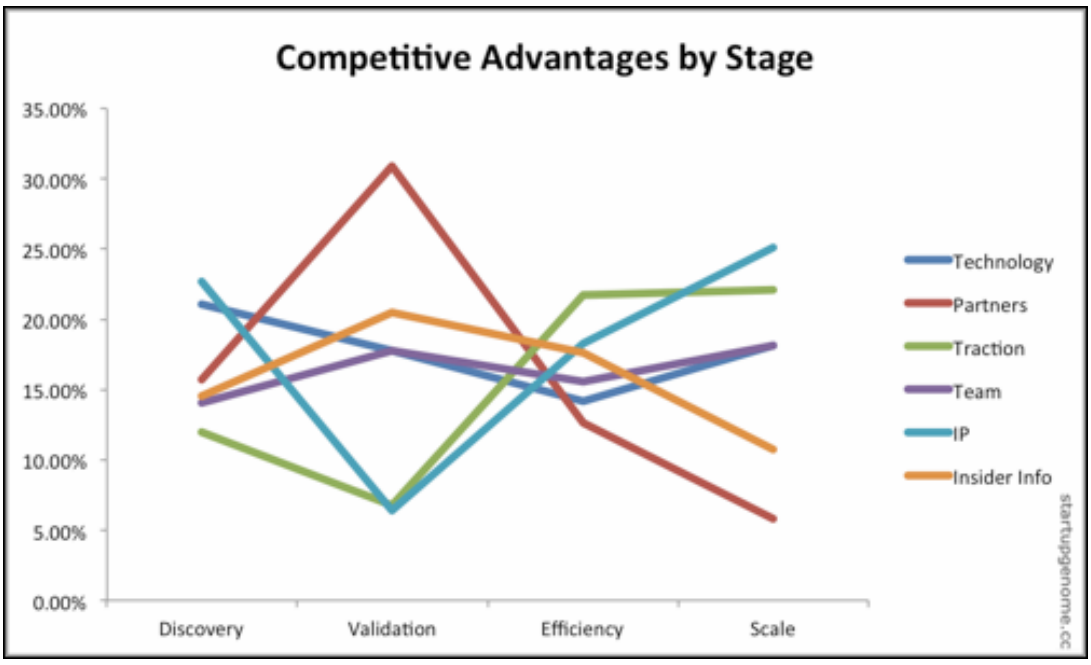

Figure 10. Competitive advantages by stage (source: Marmer et al. 2011a, 21)

The Figure 11 illustrates the key challenges by stage of consistent companies that raised money. Customer acquisition is clearly seen as the biggest challenge in all the stages, which is understandable since all the stages require customers and their feedback. Otherwise this chart is somewhat conflicting. The results were filtered so that only consistent startups that raised money are presented (Marmer et al. 2011a,

23). Consequently, these companies should be following the model consistently. However, e.g. problem solution fit was not seen as a challenge in the discovery, while it was seen as a challenge in the validation stage, in which it already should have been found. This might be due to a need to pivot (ibid., 24), but nonetheless these conflicting results suggest that even the overall consistent startups can occasionally behave inconsistently. Unfortunately Marmer and colleagues have not published the milestones and thresholds used to evaluate the stage of development due to the ongoing research, leaving slight gaps in the framework.

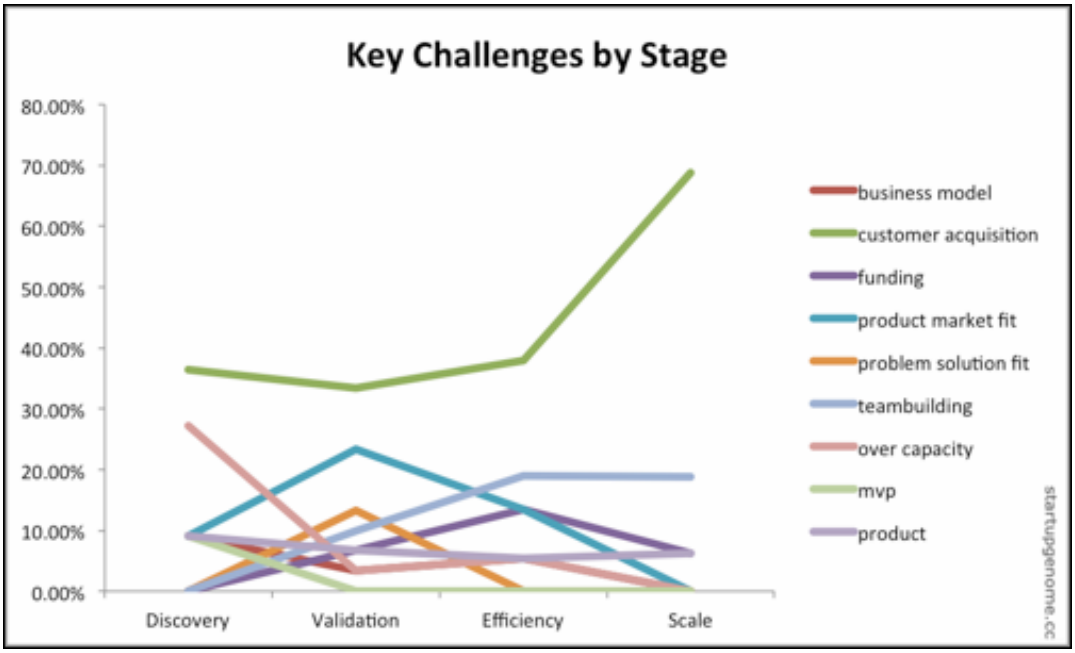

Figure 11. Key challenges by stage (source Marmer et al. 2011a, 23)

Marmer and colleagues define five dimensions to track and keep aligned with the stage of development: customer, product, team, financials and business model. The companies which follow the model and keep the dimensions aligned are called *consistent* and the ones who do not keep the dimensions aligned and go through all the stages are called *inconsistent* (Marmer et al. 2011b, 11). The inconsistency means that the startup is scaling prematurely along one or more dimensions. In their research, Marmer and colleagues noticed that premature scaling is a very common problem for startups – 70% do it (ibid., 10). These startups are less successful compared to consistent ones (Marmer et al. 2011a, 6).

The key concepts concerning premature scaling are *behavioral* and *actual* stage of development. The behavioral stage refers to what actions does the company take and how it operates in the five dimensions, while the actual stage refers to the real development stage the company is at. It is measured by quantitative customer metrics, such as user growth and number of users. Marmer and colleagues have created a list of examples of these kinds of inconsistencies, which are presented in the Table 3. (Marmer et al. 2011b, 14.)

Table 3. Examples of inconsistency (adapted from Marmer et al. 2011b, 11)

Dimension	Examples for inconsistency
Customer	• Spending too much on customer acquisition before product/market fit and a repeatable scalable business model • Overcompensating missing product/market fit with marketing and press
Product	• Building a product without problem/solution fit • Investing into scalability of the product before product/market fit • Adding “nice to have” features
Team	• Hiring too many people too early • Hiring specialists before they are critical: CFO’s, Customer Service Reps, Database specialists, etc. • Hiring managers (VPs, product managers, etc.) instead of doers • Having more than 1 level of hierarchy
Financials	• Raising too little money to get through the valley of death • Raising too much money. It isn’t necessarily bad, but usually makes entrepreneurs undisciplined and gives them the freedom to prematurely scale other dimensions, i.e. over hiring and over-building. Raising too much is also more risky for investors than if they give startups how much they actually needed and waited to see how they progressed.
Business Model	• Business Model • Focusing too much on profit maximization too early • Over-planning, executing without regular feedback loop • Not adapting business model to a changing market • Failing to focus on the business model and finding out that you can’t get costs lower than revenue at scale.

In the Startup genome report, four different types of startups were discovered: the automizer (type 1), the social transformer (type 1N), the integrator (type 2) and the challenger (type 3). The type of a startup affects the direction it should go to and decisions it should make. (Marmer et al. 2011a, 28-29.)

In type 1 startup, customers are acquired with a self service strategy. They do not rely on sales force to make a sale, but rather on the customer to buy the product or use the service independently. This typically makes them able to have quite a lean cost structure. They need good analytic tools and need to be able to make very fast decisions. They are in markets such as e-commerce, games, payments and search. (Startup Type 1 – The Automater 2013.)

Type 1N, as the name suggests, is a subset of type 1. It also aquires customers with a self service strategy, but their product or service usually has *a critical mass of users,* which they need in order to produce the essential network effects needed to provide good value for the customers. A common character in their products is that they provide “new ways for people to interact”. (Startup Type 1N - The Social Transformer 2013.)

Type 2 startup has a semi-automatic customer acquisition. Although marketing plays a large role in the process, they usually need a sales person to close the deal. The typical customers for a type 2 startups are small and medium-sized enterprices to which they tend to offer products or services which make their business processes more effective. Common markets for type 2 startups are business and social media automation, e-commerce and human resource management. (Startup Type 2 – The Integrator 2013.)

Type 3 startup has a manual sales strategy and thus require a major focus on sales. These are typically business-to-business companies, so knowledge of enterprice purchasing process is required along with skills to make a sale in that environment. Of all the types, type 3 is likely to have the largest potential market and they do not tend to have free versions or parts of their products and services. The markets common for type 3 startups are enterprise resource planning (ERP), business information systems and security. (Startup Type 3 – The Challenger 2013.)

All these types of startups are different in nature and need to take a different approach to pursuing success. The common pitfalls, risks and challenges are not the same for the types, nor are the key success factors or strategies. One of the differences is also the amount of time it takes to move through the developmental stages. Figure 12 illustrates the differences between the types of startups. The challenger clearly needs the most time thorugh the stages, which tells much about the complexity of the markets they are in. They cannot automate the sales process, which tends to take much more time.

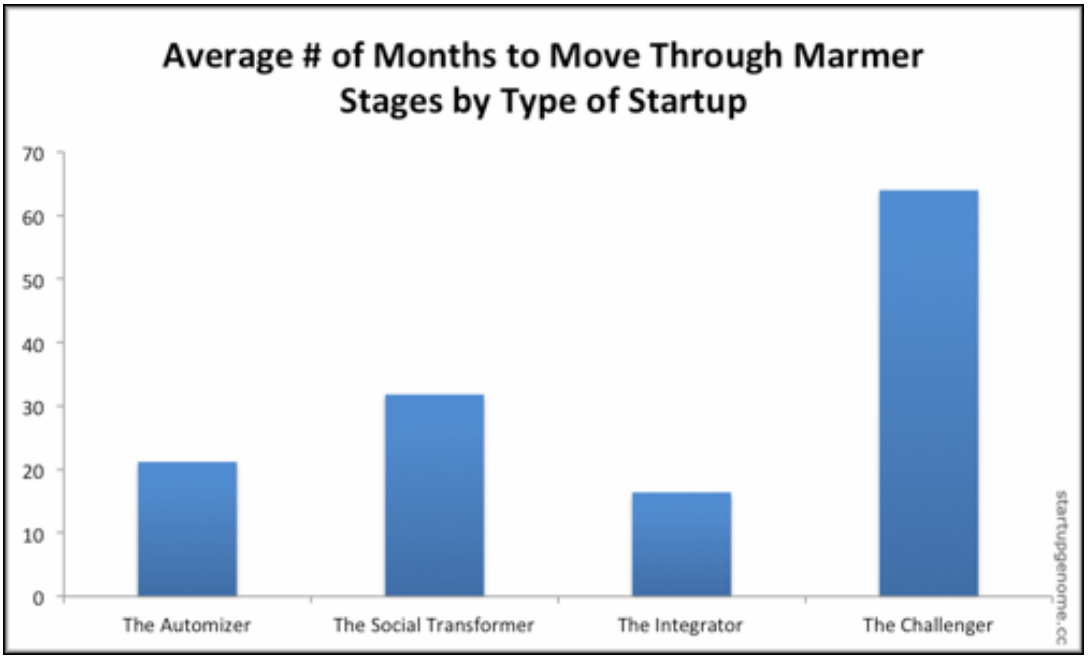

Figure 12. Average time through the stages (source Marmer et al. 2011a, 30)

Although the Startup genome framework is still under development it already provides great insights into startups and certain guiding principles are already quite well developed. In their reports they have provided much more analyzed quantitative data in the form of graphs, for example comparing differences in the behavior of consistent and inconsistent startups. For more information about this framework, see the *Startup Genome Report* and the *Startup Genome Report Extra on Premature Scaling* along with the Compass' blog.

3.4 Common elements in the frameworks

Customer development framework is a company life cycle model which describes the steps successful companies go through. As the name suggests, customers are in the very core of the framework. It explains the iterative nature of each step and divides them into clear phases and actions. Much emphasis is placed on the need for learning, validating and verifying that the right activities are conducted in the right way. The framework acknowledges that the *market type* has a critical impact on what should be done and how.

Lean startup teaches startups to avoid waste – work that does not create value. It gives a set of tools and practices to do so. The single most important tool in the framework is the feedback loop, consisting of three steps: build, measure and learn. A minimum viable product is tested on customers to gain validated learning as quickly as possible to avoid waste. By tracking actionable metrics the company can measure whether it is going the right way or not. These right metrics depend on the engine of growth, which also has a great impact on how the company should operate.

Startup genome report created a foundation for a new staged model of startup growth. It emphasizes consistency in the five dimensions of development: customer, product, team, financials and business model. By remaining consistent in the dimensions and keeping behavioral and actual stages aligned, startups can avoid premature scaling, which is the most common pitfall of a startup. The development and trajectory are affected by the type of startup. The type has a considerable impact on many critical factors and additionally in the time it takes to go through the stages.

Customers are in the very heart of all the frameworks presented. Although customer focus should be obvious, unfortunately in high technology businesses it often is not. Technological development can easily take the priority in startups, which can lead the company in to the wrong direction. Customers ultimately define the success of companies, so they should be integrated in the startup development.

The Startup genome and Customer development frameworks define developmental stages which successful startups follow. Startups should begin scaling only when they have completed the previous stages and validated that they are doing the right things. Lean startup framework on the other hand encourages startups to develop in small iterations, validating their hypotheses and learning new things in the process. This could be summarized in a somewhat contradictory sentence: startups should take their time, but do it quickly. This means that they need to prepare well for scaling, but do it before the money runs out.

One of the things that all the frameworks have in common is that they emphasize learning as a key to success. The models essentially describe a way for the startups to learn better, faster and to validate the learning. This seems natural, considering the uncertain environment, in which the startups are working.

The Customer development model and the Lean startup principles have in fact much in common with conducting action research: plan, act, observe, reflect and repeat. In Blank's model, the company makes hypotheses, tests them and validates them or learns from them, while Ries talks about build-measure-learn loop. There are fundamental similarities in all these processes, although they are put into slightly different words.

Looking from *that perspective*, one could say that startups are essentially research organizations conducting action research on their initial hypotheses. Drawing wrong conclusions, making wrong interpretations and using learnings from invalid results would mean that the subsequent actions are taking the company in the wrong direction. This would suggest that knowing how to conduct valid and reliable research should be one of the key competences in startups.

4 Results

In this chapter the empirical part of the research is presented. The trajectory of NFleet is first described as a reflection of the participant observations, interviews and the documentary analysis. It is then compared to the frameworks presented in the literature review to see if there are correlations between them. The trajectory of

NFleet is divided to three phases according to certain milestones found during the research: academic phase, business development phase and company phase.

4.1 NFleet's trajectory

4.1.1 Academic phase

The development of the optimization began as a research project in the University of Jyväskylä. There were multiple research projects over the years concerning optimization and other subjects connected to it. Some of the projects were simultaneous and linked to each other in certain ways. All these academic research projects had their own specific focus points. Instead of discussing them in detail in the following paragraphs, the overall development is described.

The beginning situation of NFleet was that the previous research concerning optimization had already established the theoretical base and knowledge. It was known that in theory the algorithms can be better and more efficient than manual route planners, but the problem identified was that there were still no large scale use of optimization software, especially in the SME sector. Large companies, which have a considerable amount of resources, had been able to take use of these efficient tools and have them developed and customized to meet their specific needs. However, a generic and powerful enough optimization engine was still missing from the industry to enable wide scale use, especially among SMEs. This lead to an interesting question: why are SME's unable to adopt these technologies?

The research group begun researching better and more efficient set of algorithms to solve the vehicle routing problems, but also how to actually get them in use in the SME sector. The problem itself was basically well-known along with certain theoretical solutions: algorithms made especially for the purpose of academic benchmarking. The need was in software development – not just mathematical expertise – to gain a broader view of the subject and its practical problems. Overall the situation was that there were good existing algorithms, but the problem was to generate a robust and generic set of algorithms that work on a wide scale of cases in addition to get them into practical use. Essentially one could say that the theoretical problem/solution fit was achieved a long time ago, but practical one was still to be

found. The research group needed to discover the practical issues hindering the adoption of these kinds of software.

Much of the development happened with the help of pilot customers. This was the way they were able to obtain a picture of what the real life issues, restrictions, constraints and problems are. One of the key metrics used to measure the development was the pilot customers' satisfaction to both the routes and, at a later stage, to the usability of the software. Academic benchmarking was conducted on a regular basis to keep track of the efficiency of the algorithms, but the main metrics were related to the pilot customers.

The development was made in small steps, each time measuring and evaluating if the direction is correct. There were multiple occasions when corrections to the direction needed to be made, but the iterative approach allowed the right direction to be found in a reasonable amount of time.

Some felt that during that time the subject was mainly 'taken forward' without sharp and clear objectives. The reasons for this did not become apparent, but it was also noted that although the goals were somewhat ambiguous, the research group was working hard to develop the software. One of the key drivers and motivators was that many of the developers felt like what they were creating was their own thing: they wanted to create something that can make a difference in the future. The idea of an own company already existed at that time, but mainly as a distant vision of something that could be.

4.1.2 Business development phase

The university project CO-SKY was a major milestone. The objective of the project was to create a foundation for a business and prepare the commercialization of the technology. Roughly half of the workload was allocated to business and commercialization activities. In the beginning of the project, the research group knew that if the project was successful, they would be likely to leave the university to continue with the software in some form or another. Although the commercial possibilities were recognized from very early on, when they began the project, it was a clear milestone in the development, since it further added a degree of commitment

to the subject. At that time the focus started shifting into the potential markets and business activities. The algorithms themselves had already proven to be quite good, so less work in relation was needed for them. The real problem still was in the customers' ability to take the software into practical use.

During the CO-SKY project the research group was not allowed to create significant business nor were they allowed to have a fully finished product at the end, because it would have distorted competition in the sector. In the beginning they thought that it was a major constraint, but later realized that they had underestimated the amount of work involved with nearly every aspect of the development. This means that the restrictions had no real impact on the project, since they never got far enough to be concerned about them.

What they learned is that for taking the technology in use, the requirements were quite large. Especially after trade fairs in Finland and Germany, the team really understood how unfinished their product still was. They thought they had their minimum viable product together, but it turned out to be a false hypothesis. Nonetheless it was a major learning for the team.

When the development of the NFleet application begun, the research group was actually intending to develop a user interface for own use, validation purposes and as an example of how it could be done. The idea was that by looking at the user interface code, ERP software developers would see, how to communicate with the application programming interface – making their job easier and lowering the barriers to integrate to existing software. However, as the user interface was developing, the research group noticed that it was actually becoming good enough for commercial use. That is how the web application was created. On the other hand, they knew from the beginning of the project that they would need a web application as one channel of distribution and that they would build it at some point in time.

During the CO-SKY project the research question was turning from "Can this be done?" into "Can money be made with this?". The commercial development was conducted on a wide range, such as market research, competitor analysis and pilot case acquisition. They were trying to discover if the sector would be willing to accept

this kind of disruptive innovation. Additionally, the business model started to take more defined shape in the process, but in fact many of the initial hypotheses were proving to be correct.

The final decision of setting up a company was made in 2014. They had a few different scenarios of how they could continue with the subject, but they eventually decided that setting up a company would be the best alternative.

4.1.3 Company phase

In June 2014 the research group left the university and the company was established. The point of development was not at the stage predicted during the beginning of the last university project, but within few weeks the web application could be considered to be a finished minimum viable product and ready to be sold to early adopters.

At this phase validating the business model and sales process are the essential development activities. No clear answers to the hypotheses concerning them could be obtained during the research project, so the validation process is continuing. An iterative approach can be seen in the development as there has already been few corrections to the business model and sales process. Major pivots have not taken place but, but certain changes in focus have been made. Fine tuning the business model and sales process has been quite common and frequent. It could be said to be an ongoing process to fine tune these as the company learn more.

Currently most of development happens on the basis of need. If no real issues rise concerning a certain subject, it is not being developed further. The reason for this is that now the primary objective is to sell the service to reach the cost and revenue balance. This will be a major milestone and will give the company more time and room to operate. By selling the service, the validation of the sales process and the product/market fit is being conducted simultaneously. Making the adoption of NFleet as easy as possible is critical in order to achieve sales. One of the other considerations is that the software can be sold in a scalable manner. The scalability is evaluated as the development is going on, and the process is fine-tuned and the needed iterations and pivots are done as needed.

Greatest challenges at the moment are seen to be in customer acquisition and marketing along with making the technology adoption as easy as possible. These are interconnected issues, since by being able to make the adoption easy and customer to gain the advantages with as little work as possible, the customer acquisition will become easier and more efficient. The key metrics used to evaluate the progress are the amount of time required in the acquisition and adoption, along with the number of customers and amount of revenue.

The key competitive advantages are seen to be in the technology and approach. The company is focusing on one specific area: optimization and the necessary data management. All the effort and resources can be used to become extremely strong in the narrow field. Since the company and technologies are new, they do not suffer from old restrictions in terms of outdated underlining technology choices or maintenance responsibilities of old versions. This means that they can move forwards freely. The technological architecture allows an easy integration, which further enables other companies to build something new upon the platform. From the end user perspective the optimization is easy and simple to use and it is considerably easier to take in use compared to many existing solutions. The SaaS business model is also seen as a key competitive advantage, since using NFleet does not require an investment decision, but is merely a purchase of service. The model makes it possible for even the smallest companies to take the service in use.

The importance of the team has come up on several occasion, and it is seen as a critical enabler. If the team was not as tight and well fused together, nothing could be achieved. The team is very committed to the work, which really makes a difference in all aspects of the business. Another important enabler for NFleet is the European Union. The company can actually view the whole EU as its home market and it does not need to battle with loads of bureaucracy in order to expand its reach. This is a two-way-street in the sense that it makes it easier for the customers to approach NFleet too.

The key components in achieving growth are believed to lie in the platform approach and the partners it enables NFleet to work with and serve. The technology is very flexible, which means that it can be applied in a wide scale of cases. This means that

industry and segment specific applications can be made by the experts on that sector with relatively generic software development skills. NFleet can focus on what it does the best and leave the rest to the experts in their respective fields.

Customer acquisition process

The process of acquiring customers in the end user segment – SME's with transportation needs – has proven to be lengthier and more demanding than expected. Some reasons for this seem to be that the key people are quite busy, the purchasing process might require some time and that the technology offered to them is a very mission critical component. The busyness shows in the difficulty of arranging meetings. The key persons might have their calendar booked for weeks or months in advance, so even taking the first step of introducing the service in person might take quite much time. The purchasing process is naturally company specific, but in some cases it might be lengthy process, which further adds to the overall time it takes to progress. Perhaps the biggest reason is that NFleet is actually a very mission critical component for the customers, so they need the time to carefully evaluate and consider what they do and how do they proceed. From NFleet's perspective this requires building trust in both the company and the technology. It must be proven, tested and validated for each individual customer that the software can really do the planning and do it well. This is natural, since if the plans would not be good, the effect on their business would be significant. Additionally, there can be seen some change resistance within the companies, and some employees might even be concerned about their job.

Overcoming these trust and mental issues is a critical step in the process. It is very easy for the customers to fall into the mindset that, since they have been able to manage their operations with manual planning, they do not need anything new. NFleet's job is to minimize the risk for the customers and lower the barriers of adoption. An interesting discovery that has been made is that transportation companies are generally very well connected to each other, which means that some of them are quite keen on hearing references. However, NFleet has a general principle of not revealing any information on their customers and contacts. In certain

cases and especially and with a permission from the reference customer, the information can be shared, but only at a later stage and by request only.

An overview of the customer acquisition process is presented in Figure 13. It begins with contacting a prospective customer. The goal is to briefly introduce the service and arrange a meeting in which the service and the company are presented more thoroughly. During the meeting it is also important for NFleet to understand the customer's processes and operations.

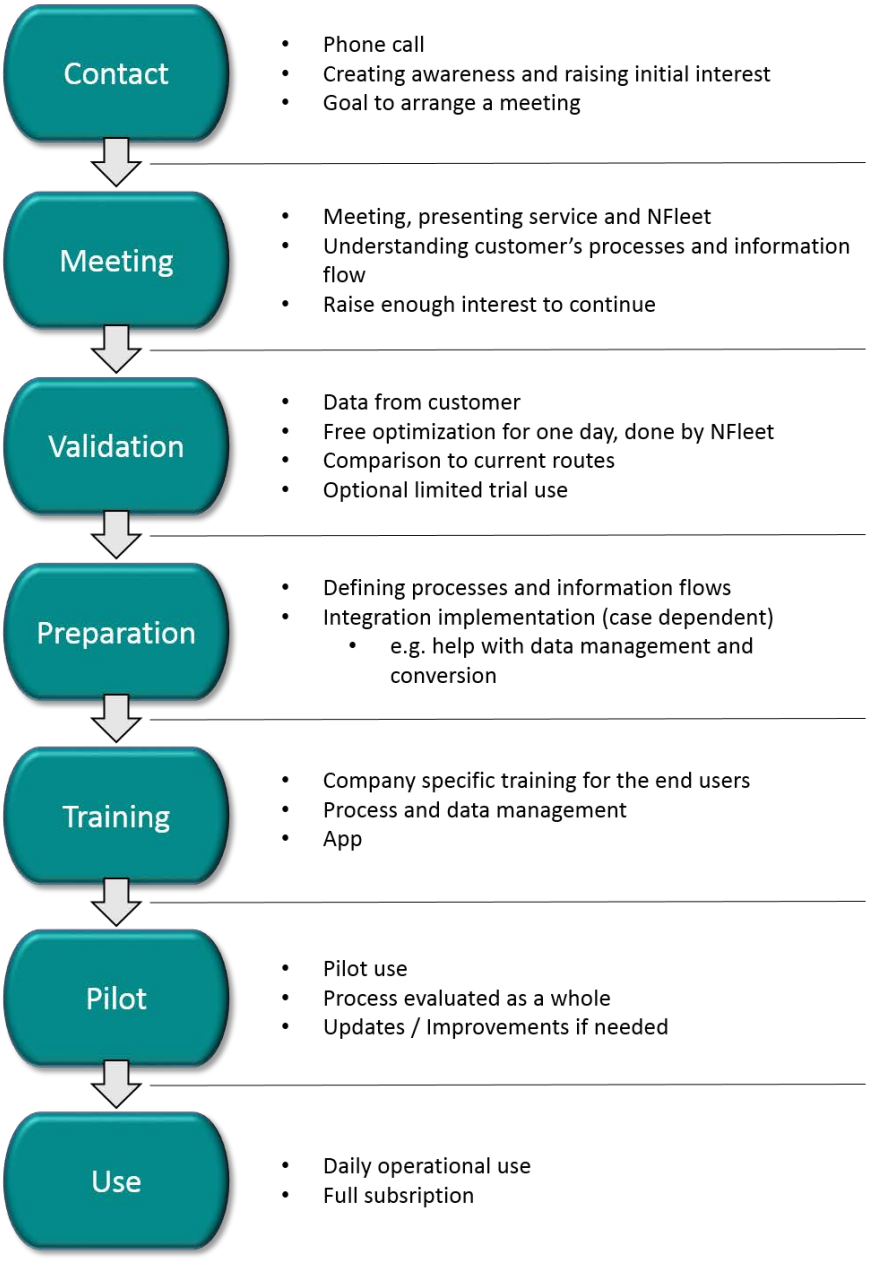

Figure 13. NFleet's customer acquisition process

After the meeting NFleet offers the customer a free optimization with customers own data in order to validate the efficiency of the technology. The customers can also try the application independently, if they so wish. This step has proven to be more complicated than expected. The technical conversions from various data formats, and even from pictures is relatively easy to solve in almost any case, but naturally some cases take longer than others. The real problems are likely to lie in the quality of data. The data provided is not always valid. There has been few occasions, when the customer has not been impressed with the optimized routes. This has naturally raised much interested inside NFleet, and after thorough investigation it was noticed that the current routes of the customers actually break the rules and parameters in the given data (e.g. time windows). This is a challenge, since high quality solutions cannot be made from bad quality data. On the other hand the successful optimizations can create slight disbelief and make the customers question if the routes could actually be used in practice. Often they need to go through the results themselves with time and thought in order to proof themselves that there are no mistakes in the results and no rules or parameters are broken. It is a large decision to make to decide to go with the optimized routes and trusting to a plan made by a computer. This validation step is perhaps the most critical, since after this step, the business negotiations actually begin. At this point a decision whether to take the service in use or not needs to be made, since during the next step NFleet needs to start charging for the work done.

The next step is also critical: preparing for the use. By this point a high level of trust to NFleet and the technology should have been achieved, because otherwise it is unlikely that the customer would start using the service. The content of the preparation step depends highly on the case, since the customers vary greatly in terms of their existing information technology and especially the data management. Whatever the current state is, for operational use, data management has to be efficient and high quality. The preparation step is essentially about helping the customer to prepare their data systems to take NFleet into operational use efficiently. Although NFleet can be used very simply by filling an excel template, it is easier and faster to use with good data management. Especially in operational use the data handling should be fast to gain all the benefits of optimization.

The next steps are training and pilot use. In the training, the data management process is went through along with the basic use of the application. In pilot step the software is gradually taken in use, validating that the whole process goes as it should to make the user experience as smooth as possible.

The final step of taking the service in the operational use is actually quite critical too. It requires significant trust to the service and more importantly changes in the processes and workflow. The employees might have change resistance, which the company should be able to manage. By taking the step-by-step approach, NFleet is trying to make the transition as easy as possible for the companies and the employees.

The customer acquisition process is far from being automated and does require a large amount of work. One important consideration in the process is that the amount of custom work should be minimized and done as quickly as possible. Although that kind of *professional services* can provide some initial revenue, it is also easy to get stuck with conducting customized solutions for each customer, which is not a scalable business model. This is an acknowledged threat inside the company. The idea is to provide a generic solution which can handle versatile problems and situations and to get it in use in the minimum time and effort possible. This is ideal from both the customers' and the NFleet's point of views, creating a win-win scenario.

4.2 Comparison with Customer development

One of the key influencers on the startup development in Blank's Customer development framework is the *type of market* the startup is operating in. Although the final decision on the market type does not need to be made before the customer creation step, a hypothesis of it is needed in the beginning, because it affects different aspects of the operations, e.g. positioning. NFleet's market type is best described with the new market approach, because it is trying to create new demand. Although optimization software is not a unique technology as such, especially the SME sector has not been able to adopt it. NFleet's business model means that it can create new demand, mainly targeting customers that do not have optimization yet.

Blank's definition of a new market does not fit NFleet's situation perfectly, but it is the closest match.

The trajectory of NFleet has not been absolutely aligned with the Customer development framework in a step-by-step manner, but the key elements have been very much alike. The academic phase of NFleet is very similar to customer discovery step, although the hypotheses tested were mainly about the technology and its applicability. The customer problem was acknowledged in previous research from a theoretical perspective, but they went out to test the problem and product hypothesis in practice. They needed to understand the practical problems better and develop as clear problem specification as possible. The university phase activities could still be considered to be more product development rather than Customer development. There were some underlining business hypotheses existing from quite early on, but they were not rigorously going towards verifying them, since the objectives in the research were not test them.

The business development phase however started to tackle the business hypotheses more systematically, although the focus was still on testing the product hypothesis. As they learned new, they developed the product and hypotheses further and made the needed changes. During this phase the research was going on simultaneously on the customer discovery and customer validation steps. The validation step included mainly *getting prepared to sell* activities*,* e.g. preparing sales materials. During the business development phase there were more clear business and product teams, which cooperated and communicated on a daily basis.

In the very beginning of the company phase NFleet started to work on selling to earlyvangelists. Since then the company has been going through the sell, position and verify phases in an iterative manner. They could almost be seen as simultaneous events, constantly developing, iterating and ultimately trying to verify all the hypotheses. The hypotheses have remained quite close to what they were in the beginning, but the changes done have mainly been in the initial focus of activities.

NFleet is in the validation step from the perspective of the Customer development framework. It has been following the framework, not to the letter, but to a certain

extent. It has not progressed in to customer creation or company building activities, which is also a good indication that their trajectory has a similar pattern to the Blank's framework. An interesting discovery is that although NFleet can be seen to be in the validation step in general, the stage of development in different segments is not perfectly alike. NFleet seems to be the most advanced in the end user segment

Taking the Customer development framework as a guideline to the operations of NFleet could offer them a well-defined action point list of how to continue. However, the current situation is that most of the elements of customer validation step are present in the operations. It is likely that the validation step will still take a while, so at the current stage, the framework cannot offer much value besides confirming that the company is being developed correctly. When reaching the point of scaling, the framework could be viewed as one reference of what activities should be performed at that stage. However, the customer creation and company building steps take the startup from learning into execution mode, where the traditional frameworks are at their best. For NFleet taking the Customer development framework as a step-by-step instructions and following them to the point would not seem to provide great value at this point of time. The main value in the framework could be seen to be in the first two steps, which actually offer a new clear perspective into building a startup. Additionally the concept of customer development in comparison to product development is highly valuable, since it takes the customers in consideration on a whole different level. Ideas and products should not be developed in a vacuum, but *outside* with the customers. Through constant interaction with the customers, the companies can learn and succeed. In the future the Customer development framework should not be ignored nor followed to the letter, but used as a one source of what could be done.

4.3 Comparison with Lean startup

Eric Ries discovered that the engine of growth is one of the key considerations for startups along with the four different ways of achieving sustainable growth. NFleet seems to have elements of two different engines of growth: paid and sticky. The paid engine of growth describes NFleet in the way that the goal naturally is to finance the customer acquisition process by the profit from earlier customers, trying to drive

down the cost of acquisition as they improve and become more effective in the process. On the other hand, the critical factor in the SaaS business model is stickiness – retaining customers. The churn rate is one of the most important key metrics to track in NFleet's case, which also means that the sticky engine growth is NFleet's main engine of growth. Although elements of paid engine of growth are present, it does not have a vital effect on the successful growth. *The repeat purchase or use* is naturally the main source of sustainable growth in this case, but rather surprisingly *word-of-mouth* seems to be important too. One of the lessons learned about the transportation industry is that the companies are actually well connected with each other and many companies are in fact cooperating rather than competing. This means that especially when NFleet is starting to target the early majority, the word-of-mouth will become increasingly important.

Minimum viable product and feedback loop have been in use at NFleet. Most activities are actually based in that sort of iterative cycles. It can be seen all around: quick and frequent releases of the versions, customer acquisition process, developing data conversion solutions and many more. The measurement step, however, has not been done in as rigorous and scientific way as Ries describes and encourages. In many cases there are no written measures, but especially the qualitative results are just simply remembered. There are far less measures in writing and thorough analyses. However, the personnel has felt that it has been adequate, since the amount of data can still be managed without any written documentation – thus being able to save some precious time. As all the development at NFleet takes place on need-basis, in this case it means that as soon as it is felt that the data cannot be managed, new ways of handling the data will be taken in use.

NFleet has been following the principles in this framework, but not quite as rigorously and scientifically as the framework presents. Nonetheless it has provided very good and efficient processes to the operations. The iterative way of developing is an integral part of NFleet's activities.

The use of the feedback loop will surely continue in the future, since it has proven its value on multiple occasions. In the future, it is likely that the rigorous way of measuring and analyzing the results becomes increasingly important as the company

grows and the amount of data needed to be processed increases. It will likely help to better keep track of the development and make the correct conclusions. The greatest value of Lean startup for NFleet is in the feedback loop. It is a tool, which can be used in almost any situation.

4.4 Comparison with Startup genome

The startup personality type defines many critical factors in terms of important measures, capital required, team construction among many other things. Both integrator (type 2) and challenger (type 3) have many common elements with NFleet. Integrators typically target SMEs, SaaS business model is common among them and they often commoditize expensive software (Startup Type 2 – The Integrator 2013). These descriptions fit NFleet extremely well, but the sales process resembles far more the one of a challenger. The observations and experiences have shown that it is very much a manual process and marketing does not currently play a key role in it. However challengers tend to get high revenue per customer, which is not the case with NFleet. On the other hand many other aspects of challengers do have a clear similarities with NFleet. Although both of these types have strong connections with NFleet, the integrator type seems to be slightly more accurate describtion.

The current stage of NFleet's development seems to be validation according to the Startup genome framework, but is on the verge of moving on to the efficiency stage. The problem/solution fit was achieved during the academic phase through the interaction with the pilot customers. In the business development phase NFleet moved into the validation stage, crafting the right product and business model. Although it already seems that product/market fit has been quite well achieved, validating it is still an undergoing activity. A few more paying customers will be needed to prove that the fit is achieved. After the product/market fit is validated, NFleet can put its resources into fine tuning the sales process and make it as effective as possible in order to prepare for the scale stage.

The key challenge at the moment is seen to be customer acquisition. The product was also mentioned as a challenge in the sense of making it even easier to use and adopt than it is. This is somewhat in line with the key challenges presented in the

framework. Teambuilding is not considered to be a challenge by any means, in fact it is rather considered to be more of a competitive advantage along with technology and partners. The technologies used are very current and enable a large scale use along with creating a partner network in the form of software companies, which can integrate the optimization into their own systems. This kind of platform approach opens a wide array of different uses with the help of the partner network. At this point of time, the importance of partners is not seen to decrease as the company evolves through the stages, which is quite the opposite of the findings in the Startup genome report.

Currently the development seems to be fairly consistent. None of the examples of inconsistency actually seem to have much in common with the current state of NFleet. The closest one would be spending too much on customer acquisition, but even that is quite farfetched, since the spending would in this case be own labor and is a part of the final product/market fit validation and searching for the repeatable and scalable customer acquisition process. This learning process takes work and time and definitely requires spending time with customers. During the time at the university, the product was made technologically scalable, which according to this framework would seem to have been inconsistent behavior. Otherwise the development looks consistent and majority of development steps taken in these dimensions come from actual *need.*

The list of inconsistency examples is a great tool to have at hand. Viewing it from time to time makes one consider and assess if the all the dimensions are aligned and the overall development consistent. The different startup types have their own critical factors in achieving growth, which can help to focus attention to the right areas, but as NFleet does not perfectly fit to a single type, the factors need to be critically viewed. Nonetheless those aspects can prove useful in the future. One especially interesting tool connected with Startup genome is Compass benchmarking and metrics tool. As the amount of data increases at NFleet, this could be used to evaluate the progress against peers and find out the areas that are lacking behind. The development stages can give NFleet a rough outline of what needs to be achieved next.

5 Discussion

This research aimed to take a thorough view into NFleet's trajectory and compare it to selected startup frameworks. The objective was to discover if the trajectory is aligned with the frameworks and assess the value the frameworks could give to NFleet. The research questions were:

- What has the trajectory of NFleet been so far?
- How consistent is NFleet's trajectory with startup frameworks?
- What value could the frameworks offer to NFleet?

NFleet's trajectory can be divided into three distinct phases: academic phase, business development phase and company phase. In the academic phase the team was conducting academic research on the optimization, knowing that there are commercial opportunities in the area. During this phase the optimization was being developed with customers and the problem/solution fit was found. The last university project, CO-SKY, began the business development phase. During that phase the commercialization activities gained much more importance, since the service was being prepared to market. The business model was being developed further simultaneously. Very early in the company phase the focus shifted to customer acquisition process and achieving sales.

Overall, NFleet's trajectory has been quite consistent with the frameworks presented in this thesis. Customer development and Startup genome are staged models of growth, while Lean startup rather provides a set of development tools and approaches. Although the time in the university did affect the way and order of how things progressed and were developed, the elements of the staged models of growth could be identified. Broadly speaking, the academic phase was similar to the first stages of both Customer development and Startup genome. The business development phase on the other hand seemed to go into the second stages of the frameworks. From Startup genome's perspective NFleet is close to moving into the third stage, but from the point of view of Customer development the team is likely to spend some more time in the second stage. The differences in the trajectories are

very likely to lie in the university background, since as an environment the university was far from the corporate world. At the time the company was not established yet, which meant that team's situation was quite unique: they were building a product and making preparations for commercialization, but did not have the risks and pressures of the corporate world. Although during the university time the development was not perfectly consistent with the frameworks, the main elements and tools have been in use to some extent. The feedback loop from Lean startup has been in use already since the academic phase. Currently it seems that the trajectory is quite well aligned with the staged models of growth and the main tool from Lean startup is in use.

The value the frameworks can offer NFleet is mainly on a larger conceptual level and as sources of reference. Starting to follow a single model to the letter would unlikely provide much added value to the operations, since the critical elements seem to have been acknowledged already. The feedback loop, however is an effective tool that has been in use in the company and will continue to be. Viewing the models from time to time could offer a chance to reflect on the development activities and view them from a broader perspective. The larger concepts such as the importance of customers and their role, learning as a key to success and avoiding work that does not add value are highly important. These kinds of broader guiding principles should be at the core of the company and are of great value.

As NFleet is able to increase its amount of customers, more rigorous forms of measuring and benchmarking could be taken in use. By developing good measures, NFleet could better evaluate, when the product/market fit is validated. Finding this point in time is critical in order to avoid premature scaling. After the validation the company can move into increasing the efficiency of the sales process and finally reaching the point when it should start scaling.

The results suggest that NFleet is on the right track and has both knowingly and unknowingly taken in consideration the critical elements of success found in the literature. It seems that the rate of technology adoption will be the key variable affecting the future of NFleet. As all the frameworks emphasize learning as a key to success, it would seem that on of the main goals should be to learn. Having the

ability to conduct constructive self-criticism and regularly reviewing the operations and activities against customer metrics, should provide the company valuable learning opportunities. By learning more about the customers and understanding them even better, NFleet should be able to make the adoption constantly easier, which in turn should increase the chances of success.

Limitations, reliability and validity

The case study method suited well for this research, since the goal was to gain deep understanding of a contemporary phenomenon. The method however is quite challenging. There are numerous views of what a proper case study should be and even the experts do not seem to agree on all of its aspects. This means that even designing the research proved to be challenging.

The qualitative nature of the research means that the role of the researcher is emphasized. It is very different compared to quantitative analysis, where the reliability and validity of the research are more straightforward to achieve. Saunders et al. (2009, 156) define reliability as the extent to which the results can be replicated using same data collection and analysis techniques. As participant observation was a key source of data in this research, it can be questioned to what extent the observations are the reality. The researcher's own views, previous experience and many other factors affect the way the reality is seen and interpreted, which means that a same situation will be seen somewhat differently by different individuals. The observations for this research took place on a wide time frame. This should increase the reliability of the observations, since it relies on rich set of observations in many different situations. The interviews and documentary data was coded with the help of the literature. This way the themes and similarities were easier to find, but this could have brought some bias into the interpretation too. Since the company's development was looked through the frameworks' perspective, it is possible that some interpretations are slightly distorted.

According to Lincoln and Guba the validity of qualitative research can be evaluated by four criteria: credibility, transferability, dependability and confirmability (Lichtman 2013, 298). Kananen (2008, 126) states that the credibility can be enhanced by using

triangulation. In this research there were three different data collection methods used, so that the credibility problem could be addressed. Transferability refers to the extent to which the research results can be applied to a wider population (Shenton 2004, 69). The results of this research cannot be claimed to be transferrable, but it was known from the beginning and it was not the objective of the research to find generalizable results. This study focused on understanding a single case. Dependability refers to whether the same results can be achieved by reproducing the research (Kananen 2008, 126), which is the same question that the reliability answers. Confirmability assesses if a different researcher would come up with the same results from the same data (ibid., 127). In other words the question is about the objectivity of the researcher (Shenton 2004, 72). The researcher acknowledges the possibility of bias due to own personal perceptions, although an objective view has been the goal. The documentation concerning the data collected is not well presented for privacy reasons. It was decided that in order not to reveal too much on internal aspects of the company, it is better not to be very specific in the documentation. From the perspective of the research this is a weakness, since for an outsider evaluating the validity becomes somewhat challenging. This is acknowledged by the researcher, but has been a conscious decision.

Due to the limited resources, the research only dealt with three frameworks. A broader view in to the startup environment could have been achieved by using more frameworks in the comparison. If more resources were available, it would have been interesting add a perspective from the world of university spin-offs and compare if the spin-off startups differ greatly from startups without a university background.

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APPENDICES

Appendix 1. Discussion guide for themed interview

-How did the development of NFleet began?

-What was being researched?

-Could you describe the research projects that were before the CO-SKY?

-What were the objectives of those projects?

-How would you describe the process of developing the technology? What were the key motivators?

-What were the key metrics used to stay on track and know that the direction is correct?

-At what stage were the commercial possibilities of the technology recognized?

-How did that affect the research?

-When was it decided that the company is going to be established?

-How did that affect the research?

-How has the role of transportation companies evolved in the process?

-How would you describe the business model and sales roadmap of NFleet?

-What are the key aspects in achieving growth?

-What are the key challenges currently and how have they changed compared to the past?

-What do you see are the most important competitive advantages of NFleet?